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DETECTION AND MAPPING OF MINERALIZED AREAS IN THE CORTEZ-UINTA BELT, UTAH-NEVADA USING COMPUTER-ENHANCED ERTS IMAGERY

Type II Progress Report

Lawrence C. Rowan, U.S. Geological Survey, Reston, Va. 22092
Alexander F.H. Goetz, Jet Propulsion Laboratory, Pasadena, Ca. 91103
Roger P. Ashley, U.S. Geological Survey, Menlo Park, Ca. 94025

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SUMMARY OF RESULTS

1. The reflectance spectra of most hydrothermally altered rocks are characterized by broad ferric-iron absorption bands short of 1.1 μm and a sharper hydroxyl band near 2.2 μm; maximum reflectance occurs near 1.6 μm. These features become more prominent as albedo increases.

2. MSS color-ratio composite images are the most effective and practical means for detecting and mapping limonitic rocks in areas having less than about 50 percent desert-brush cover and less than 25-35 percent coniferous-tree cover.

3. However, limonitic altered and limonitic unaltered rocks cannot be distinguished in MSS color-ratio composite images. In addition, some important altered rocks are not limonitic and therefore are not distinctive in MSS color-ratio composites. Significantly, most of these iron-deficient altered rocks have a prominent 2.2 μm absorption band.

4. Preliminary analysis of NASA 24-channel images for two contrasting sites shows, as indicated by analysis of the field spectra, that color-ratio composite images using 1.6/2.2 μm as one color and ratios of

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shorter wavelength bands for the other two colors are highly effective for distinguishing between limonitic unaltered and limonitic rocks and for detecting iron-deficient hydrated altered rocks. The importance of the 1.6/2.2 μm ratio image results from the general absence of the 2.2 μm hydroxyl band in unaltered rocks and the persistence of this band in altered rocks.

5. Comparison of the respective estimated costs of using the MSS color-ratio composite images and conventional field methods for mapping hydrothermally altered rocks suggests that a 10:1 benefit can be obtained for large well-exposed areas where limonitic altered rocks are widespread and limonitic unaltered rocks are not common. The benefit declines sharply as the abundances of limonitic unaltered rocks and iron-poor altered rocks increases. The availability of spectral information in the 1.6 μm and 2.2 μm regions would restore the above mentioned benefit. The cost benefit declines as the size of the map area decreases. However, continuously rising manpower and field-operating costs work to the advantage of the MSS approach. Higher spatial resolution would also increase the cost benefit.